DETECTION OF CORRELATION BETWEEN DETECTED TRANSMISSIONS FROM MULTIPLE BASE STATIONS AND A KNOWN CODE IN A MOBILE TELECOMMUNICATIONS SYSTEM

This application claims priority under 35 U.S.C. §§ 119 and/or 365 to 0028870.4 filed in the United Kingdom on Nov. 27, 2000 and to 60/250,145 filed in the United States of America on Dec. 1, 2000; the entire content of which is hereby incorporated by reference.

TECHNICAL FIELD OF THE INVENTION

This invention relates to a mobile communications device, and in particular to a device for use in a spread spectrum communication system.

BACKGROUND OF THE INVENTION

In a Wideband Code Division Multiple Access (W-CDMA) cellular radio telecommunications system, for example as used in so-called 3rd Generation mobile communications systems, a mobile station (MS) is able to move around an area in which multiple cells are defined. Each cell is served by a base station. The base stations use the same carrier frequency for their transmissions, and so these transmissions are identified by means of code signals which are transmitted by the base stations.

In order to establish a connection with a base station, a mobile station must go through an acquisition procedure. This requires that the mobile station be synchronised to the base station. This synchronisation is achieved by means of a matched filter. The maximum length of this filter is set by the frequency deviation which may exist between the base station and the mobile station, and so the length of the filter is restricted.

When the mobile station has established a connection with a base station, it must then continue to make measurements on signals received from other base stations. Again, the mobile station must synchronise to the other base stations before making these measurements. However, at this stage, the restricted length of the matched filter increases the time taken to synchronise to the base stations.

EP-0884856 describes a system of this type, in which the speed of acquisition is sought to be increased by using multiple matched filters.

SUMMARY OF THE INVENTION

The present invention relates to a spread spectrum communications system, in which a mobile station includes a matched filter which can be divided into segments.

In a first synchronisation mode, when a frequency deviation is expected to be relatively large, the filter is used divided into segments. In a second synchronisation mode, when the frequency deviation is expected to be smaller, the filter is used undivided. Thus, in the first mode, a reduced filter length avoids difficulties caused by frequency deviation, while, in the second mode, an increased filter length allows faster acquisition.

The first synchronisation mode can be used when the receiver is initially establishing a connection to a base station, while the second synchronisation mode can be used after a connection has been established, when detecting transmissions from other base stations.

According to another aspect of the invention, there is provided a method of controlling a receiver.

It should be emphasised that the term "comprises/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a schematic representation of a mobile communications network in accordance with the invention.

FIG. **2** is a block schematic diagram of a mobile communications device in accordance with an aspect of the invention.

FIG. **3** is a block schematic diagram of a matched filter in the mobile communications device shown in FIG. **2**.

FIG. **4** is a flow chart showing a first synchronisation procedure in accordance with an aspect of the invention.

FIG. **5** is a flow chart showing a second synchronisation procedure in accordance with an aspect of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. **1** shows a part of a cellular mobile communications network, operating in a Wideband Code Division Multiple Access (WCDMA) system. FIG. **1** shows just four cells **C1**–**C4**, although it will be realised that these represent only a small part of a typical network. Each of the cells **C1**–**C4** includes a respective base station **BS1**–**BS4**. A typical mobile station (MS) **100** is also shown in the system. Again, it will be apparent that a real network will contain many such mobile stations.

Each base station BS transmits information to the mobile stations using the same nominal carrier frequency. These transmissions are spread using a Short Code. The mobile station is able to distinguish between the base stations because each base station also applies a respective Long Code to its transmissions. However, one part of each signal transmitted from a base station does not have the Long Code applied to it. This is the Long Code Masked symbol.

Although the invention is described herein with reference to a W-CDMA system, it will be apparent that it can be used in any system which uses a Long Code Masked symbol in this way, or, indeed, in any communication system in which a receiver must detect a code in a received signal.

When a mobile station **100** is switched on, it must establish a connection with one of the base stations. This requires it to synchronise to the transmissions from the base station. Firstly, the mobile station must detect the slot timings of transmissions from the base station. This is done by detecting the correlation between the known short code and a received signal, using a matched filter. Then, the long code can be detected.

A somewhat similar process carries on when a base station has been acquired. After acquisition, the mobile station detects transmissions from other base stations, to aid in determining whether it should handover communications to one of the other base stations. Similarly, the mobile station must detect the slot timings of transmissions from the other base station, by detecting the correlation between the known short code and a received signal using a matched filter. This allows the long code of the other base station to be detected.

FIG. **2** shows the relevant components of the mobile station **100**. The invention is described herein with reference